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data, and for inverting a polarity of the analog output of
said D/A converter according to the signal polarity inversion
signal,

C4
✓ wherein a number M of said D/A converters is less
than a number N of said switching elements arranged in a
horizontal direction, and analog signals are sequentially
inputted from particular ones of said M D/A converters to N/M
plural switching elements arranged in a horizontal direction.

REMARKS

Claims 1, 2, 4, 5, 7-19, 21, 22 and 24-48 are now
presented for examination. Claims 1, 18, 38 and 43, the only
independent claims, have been amended to define still more
clearly what Applicants regard as her his their invention.
Claims 3 and 20 have been cancelled without prejudice.

Claims 1-5, 7-12, 15, 16, 18-22, 24-29, 32, 33, 35
and 38-47 were rejected under 35 U.S.C. § 103 as obvious from
Lewis in view of Yamaguchi and Shinya. Claims 13, 14, 17,
30, 31, 34, 36, 37 and 48 were rejected under 35 U.S.C. § 103
as obvious from Lewis in view of Yamaguchi and Shinya and
further in view of Misawa.

As shown above, independent Claims 1, 18, 38 and 43 have been amended to recite Applicants' invention more clearly. The amended independent claims are believed patentable over the prior art for at least the following reasons.

Amended independent Claim 1 recites, inter alia, that the number of D/A converters is less than the number of switching elements laid out in the horizontal direction. By virtue of this structure, data from a plurality of horizontal signal lines can be processed in series by a single D/A converter. This advantageous structure allows for a smaller panel size and for a desirable reduction in circuit block area. Additionally, the number of the D/A converters may be freely designed according to the upper limit of the driving frequency of the converter.

Lewis shows switched capacitor analog circuits. Yamaguchi is relied upon as showing inverting analog signal polarity. Shinya is relied upon as showing a buffering of D/A converter output. However, Applicants have found nothing in any of these references that teaches or suggests the feature of amended Claim 1 discussed above.

Accordingly, amended Claim 1 is believed clearly patentable over the cited art. Amended Claims 18, 38 and 43

also recite the salient feature discussed above and are believed patentable for at least the reasons developed above with respect to Claim 1.

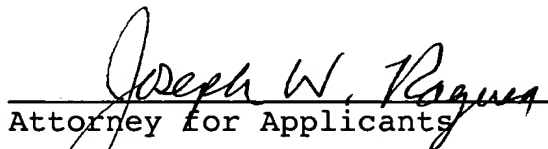
A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual reconsideration of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,


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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Thrice Amended) A matrix substrate having plural switching elements provided in matrix corresponding to intersecting points of scanning lines and signal lines, plural picture element electrodes connected to the switching elements, and horizontal circuits and vertical circuits for inputting the signals to the switching elements, the matrix substrate comprising:

a horizontal scanning circuit for sampling a picture data based on digital picture signals;

a latch circuit for memorizing the data synchronously with output from the horizontal scanning circuit;

a D/A converter for converting an output from the latch circuit into analog signals;

plural signal transfer switches provided between the D/A converter and the signal lines;

a selection circuit for selecting at least one of the signal transfer switches;

circuitry which inputs signal-polarity inverting

signals together with the picture data, and which inverts the polarity of the analog signal from the D/A converter; and

a buffer disposed between said D/A converter and said selection circuit, which stores the analog signal of inverted polarity from the D/A converter,

wherein a number M of said D/A converters is less than a number N of said switching elements arranged in a horizontal direction, and analog signals are sequentially inputted from particular ones of said M D/A converters to N/M plural switching elements arranged in a horizontal direction.

3. (Cancelled)

18. (Twice Amended) A liquid crystal device comprising a matrix substrate having plural switching elements provided in matrix corresponding to intersecting points of scanning lines and signal lines, plural picture element electrodes connected to the switching elements, and horizontal circuits and vertical circuits for inputting the signals to the switching elements; a counter substrate opposing to the matrix substrate; and a liquid crystal material placed between the matrix substrate and the counter substrate, the matrix substrate comprising:

a horizontal scanning circuit for sampling a

picture data based on digital picture signals;

a latch circuit for memorizing the data
synchronously with output from the horizontal scanning circuit;

a D/A converter for converting the output from the
latch circuit into analog signals;

plural signal transfer switches connected to
output of the D/A converter;

a selection circuit for selecting at least one of
the signal transfer switches; and

means for inputting signal-polarity inverting
signals together with the picture data, and for inverting the
polarity of the analog output of the D/A converter,

wherein a number M of said D/A converters is less
than a number N of said switching elements arranged in a
horizontal direction, and analog signals are sequentially
inputted from particular ones of said M D/A converters to N/M
plural switching elements arranged in a horizontal direction.

20. (Cancelled)

38. (Amended) A matrix substrate having plural
switching elements provided in matrix corresponding to
intersecting points of scanning lines and signal lines, plural

picture element electrodes connected to the switching elements, a horizontal circuit for inputting the signals to the switching elements, and a vertical circuit for driving said scanning lines, the matrix substrate comprising:

a horizontal scanning circuit for sampling a picture data based on digital picture signals;

a latch circuit for memorizing the data synchronously with output from the horizontal scanning circuit;

a D/A converter for converting the output from the latch circuit into analog signals; and

polarity inversion means for inputting, together with the picture data, a signal polarity inversion signal and for inverting a polarity of the analog output of said D/A converter according to the signal polarity inversion signal,

wherein a number M of said D/A converters is less than a number N of said switching elements arranged in a horizontal direction, and analog signals are sequentially inputted from particular ones of said M D/A converters to N/M plural switching elements arranged in a horizontal direction.

43. (Amended) A liquid crystal apparatus, comprising:

a matrix substrate having plural switching elements provided in matrix corresponding to intersecting points of scanning lines and signal lines, plural picture element

electrodes connected to the switching elements, a horizontal circuit for inputting the signals to the switching elements, and a vertical circuit for driving the signal lines;

an opposite substrate opposing said matrix substrate; and

a liquid crystal material between said matrix substrate and said opposite substrate,

said apparatus further comprising a horizontal scanning circuit for sampling a picture data based on digital picture signals, a latch circuit for memorizing the data synchronously with output from the horizontal scanning circuit, a D/A converter for converting the output from the latch circuit into analog signals, and means for inputting a signal polarity inversion signal together with the picture data, and for inverting a polarity of the analog output of said D/A converter according to the signal polarity inversion signal,

wherein a number M of said D/A converters is less than a number N of said switching elements arranged in a horizontal direction, and analog signals are sequentially inputted from particular ones of said M D/A converters to N/M plural switching elements arranged in a horizontal direction.